National Summit on

Defense Policy, Acquisition, Research,

Test & Evaluation Conference

Long Beach, California

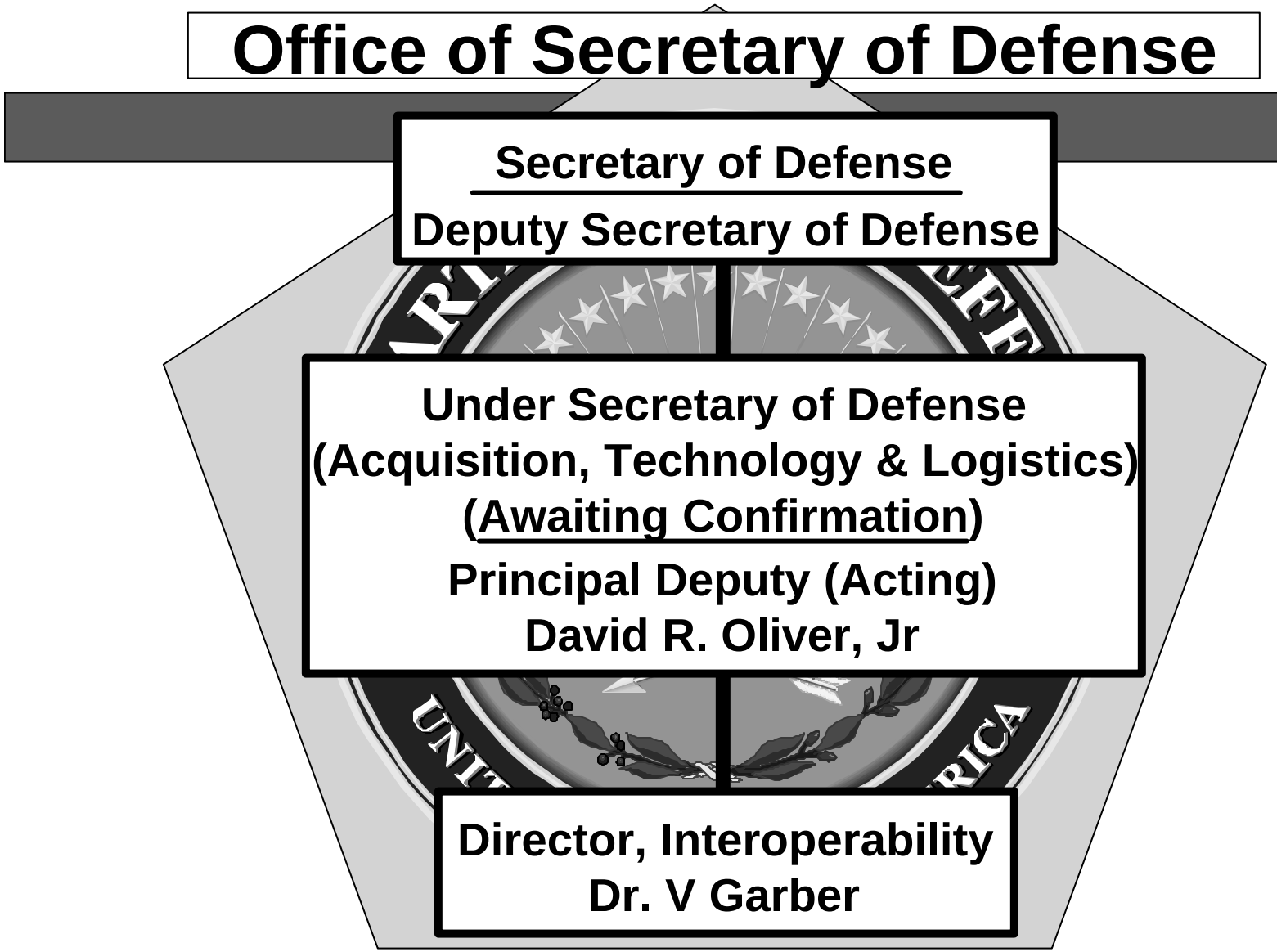
26 March 2001

Simulation Based Acquisition
The Future Way DoD Will Do Business

Col. "Crash" Konwin, USAF
Special Advisor to Director Interoperability
Office of the Under Secretary of Defense
OUSD(AT&L)

3070 Defense Pentagon Room 3E144
Washington, DC 20301-3070
(703) 697-8177 DSN 227-8177
Crash.Konwin@osd.mil

Office of Secretary of Defense



-- Interoperability --
Fundamental to Effective Warfighting

Clearly, if we want to achieve 100% of warfighting capability -- we must develop, test, operate and sustain fully interoperable weapons systems.

Function

- Requirements Analysis
- System Design & Test
- Legacy System Fix
- Certification
- Training Exercises
- Contingency Planning
- Operations

Essential Tools

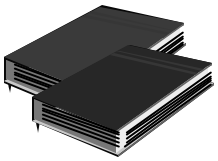
M&S
SBA
Collaborative Eng Env
JDEP
HLA

Overview

- **Background**
- **The Concept**
- **The Evidence**
- **Service Implementations**
- **DoD and Other Initiatives**
- **Summary**

TWO REVOLUTIONS ARE OCCURRING IN DOD

3 Major DoD Documents



QDR
DRI
NDP

Common reform principles

- **Focus enterprise on unifying vision**
- **Commit ldrship team to change**
- **Focus on core competencies**
- **Streamline orgs for agility**
- **Invest in people**
- **Breakdown barriers between orgs**
- **Exploit info technology**

QDR	**Quadrennial Defense Review**
DRI	**Defense Reform Initiative**
NDP	**National Defense Panel**

What we Buy:
Revolution in Military Affairs

- **Build on new warfighting concepts of Joint Vision 2010**
- **Joint Experimentation**

How we Buy:
Revolution in Business Affairs

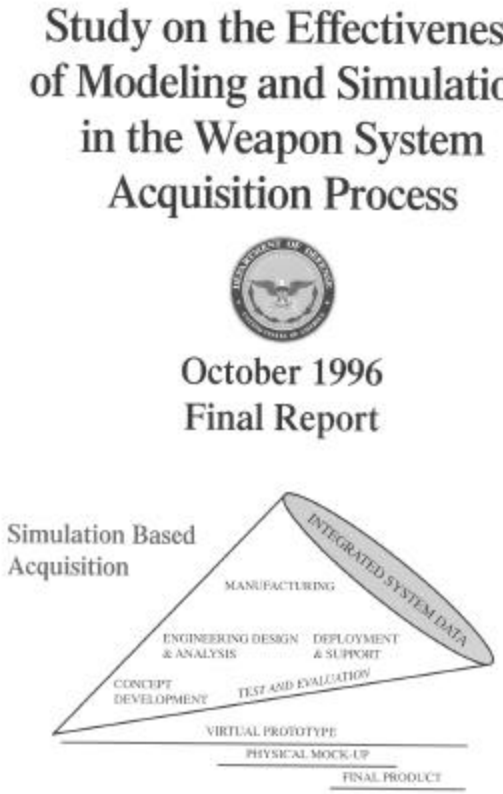
- **Take advantage of business process improvements pioneered in private sector**
- **A must, to maintain competitive edge in changing global security arena**

Background

- **A confluence of factors as SBA genesis**
  - Declining defense budgets and force structure
    - Modernization versus Recapitalization
  - Revolution in Military Affairs -- Impacts *what we buy*
  - Revolution in Business Affairs -- Impacts *how we buy*
    - 1995 SECDEF direction -- IPPD and IPT (Life cycle, S-O-S)
    - Vice President's National Performance Review (NPR) -- 25% reduction in delivery time for new systems
    - DoD stretch of NPR goal to 50% reduction, plus reduction in Total Ownership Costs
  - Cost-performance consideration allow routine use of advanced IT, modeling and simulation tools
    - Defense Systems Affordability Council recognizes M&S potential

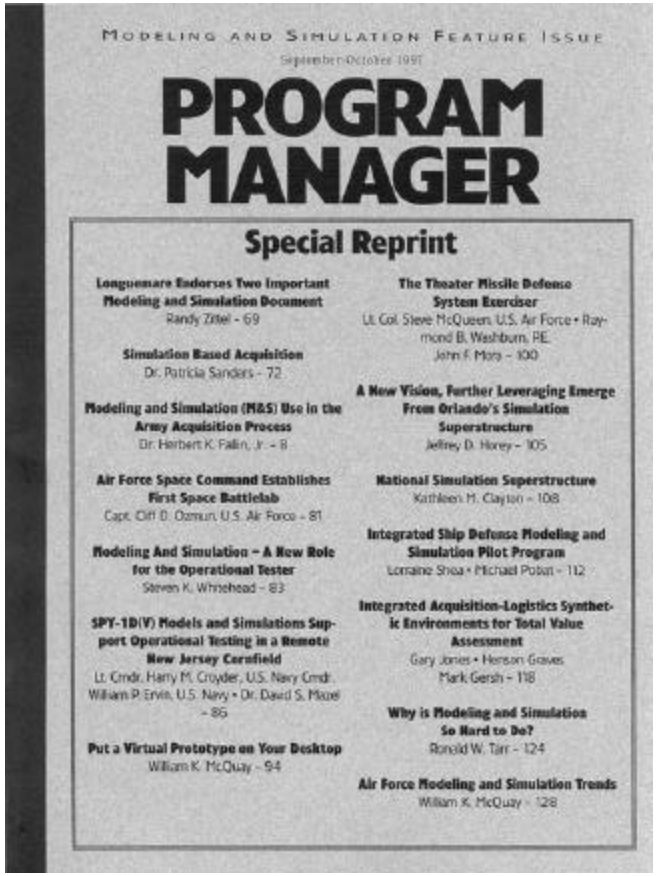
The Evidence

(SBA potential -- confidence builders)



- *Design:* **ATARDEC tank prototype -- 14 engineers, 16 months versus 55 engineers, 36 months**
- *Logistics:* **reduced Seawolf class sub parts list from 95K to 16K items**
- *Production:* **first time correct bending of B-2 titanium electronic cable conduit using CAD models**

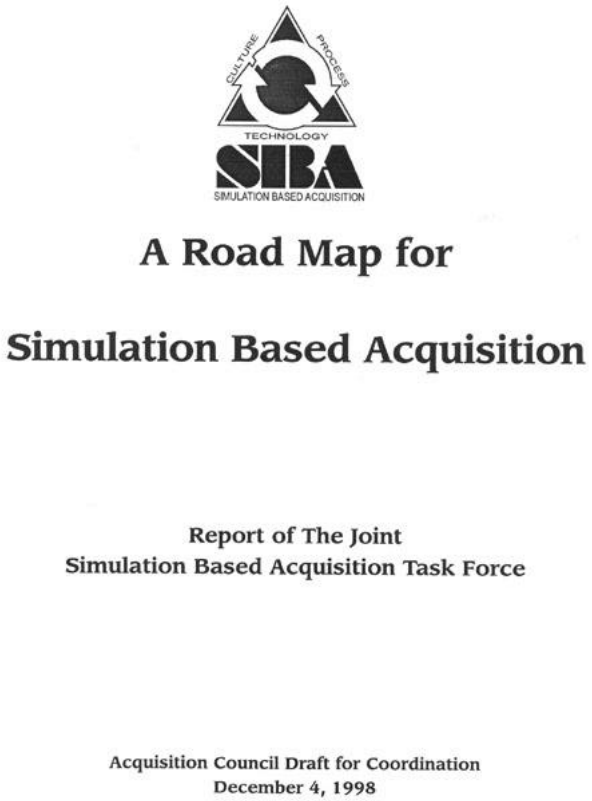
SBA Benefits
(Risk reduction)



M&S Use in the Army Acquisition Process, Dr Herbert K. Fallin, Jr

- Continuous evaluation of system development
- Rapid evaluation of concept design
- Reduce and delay need for physical prototype
- Facilitate continuous user participation in development process
- Efficient development/evaluation of manufacturing plans
- Reuse of system software and hardware in training simulators
- Ability to test proposed system at sub-component, component, and system level

The SBA Initiative



- **Identify actions needed to implement new approach to systems acquisition efficiently, expeditiously, and non-intrusively**
- **1998 Joint SBA task force identified cultural, process, and technical elements**
- **Current approach**
  - Encourage individual efforts
  - AFAC effort -- descriptive framework for M&S support of advanced acquisition environment (01S-SIW-091)

SIMULATION BASED ACQUISITION (SBA)

Vision

…to have an Acquisition Process in which DoD and Industry are enabled by robust, **collaborative use of simulation technology** that is **integrated across acquisition phases and programs**.

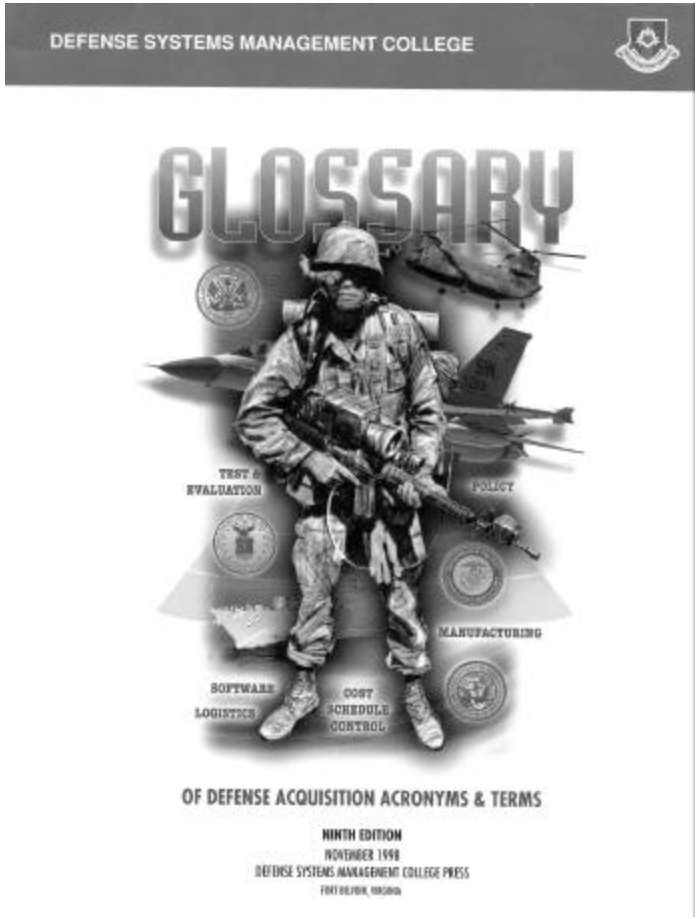
Goals

Substantially **reduce the time, resources and risk** associated with the entire acquisition process;

Increase the quality, military worth and supportability of fielded systems, while **reducing** their **total ownership costs throughout the total life cycle**;

Enable Integrated Product and Process Development (IPPD) **across the entire acquisition life cycle**.

Simulation Based Acquisition
(Vision / Definition)

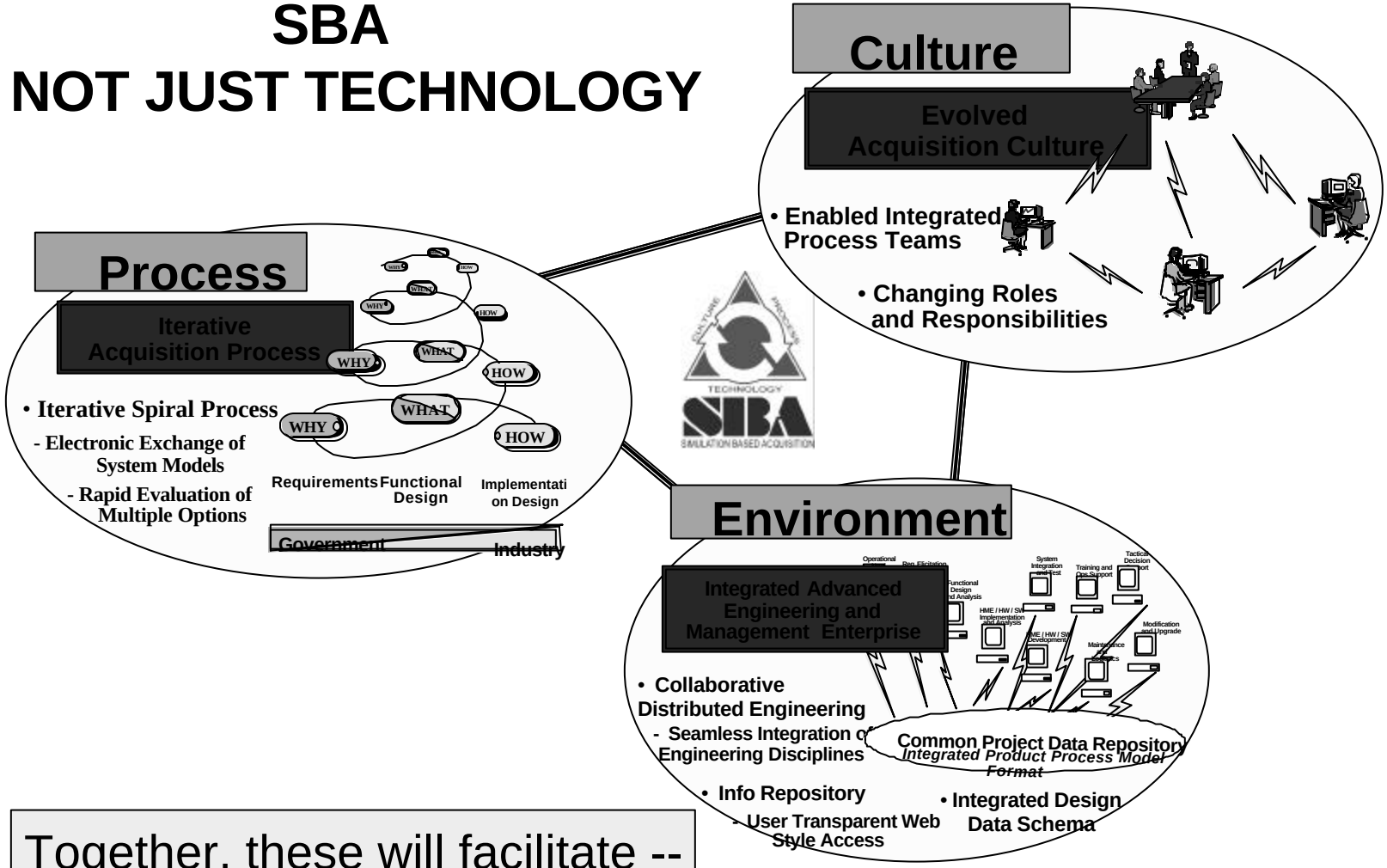


"A concept which envisions greater and more integrated use of modeling and simulation in the acquisition process. DoD and industry would be enabled by robust, collaborative use of simulation technology that is integrated across acquisition programs and phases."

SBA: WHAT IS IT?

- **SBA is a robust M&S engineering environment --**
  - **Starting early, from initial requirement & concept**
  - **Intensive "wringing-out" in synthetic, collaborative environment of cost, function, performance across system life cycle**
  - **Reuse of M&S across system life cycle, across programs/services**
- **SBA is a revised acquisition process --**
  - **Integrating Requirements, Acquisition, Training, Operations, Sustainment, T&E, etc functions using collaborative environment**
  - **Rapid, multiple assessments of trade space prior to locking requirements**
  - **Thorough understanding early of total ownership cost implications of performance requirements & design**
- **SBA is cultural change --**
  - **New educational curriculum**
  - **Empowered collaborating teams, including industry partners**
  - **Up-front emphasis & investment on M&S**
  - **Increasing reliance on M&S to reduce design risk**

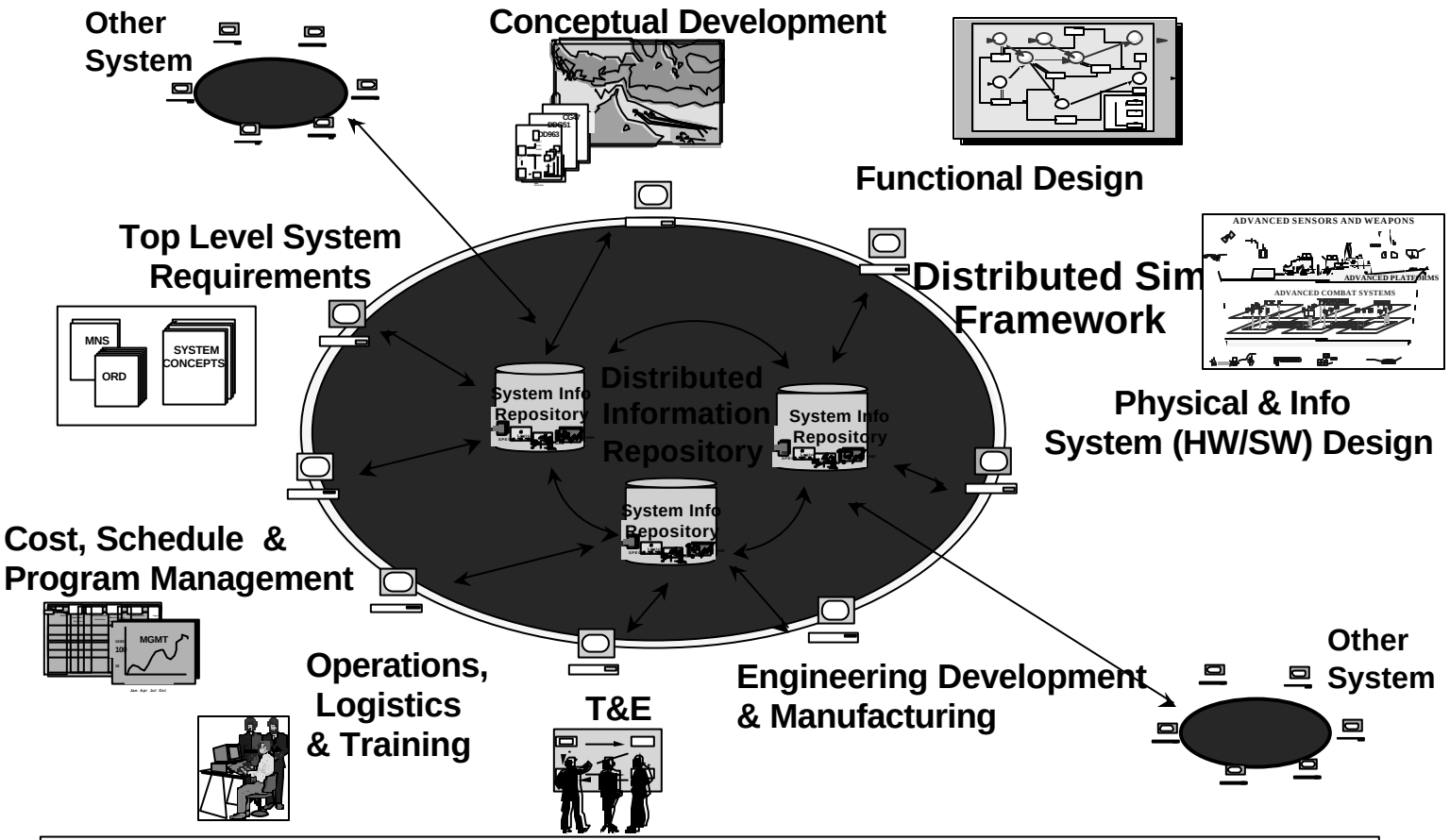
SBA
- NOT JUST TECHNOLOGY



Together, these will facilitate --

An unprecedented quality of enterprise-wide, collaborative decision making across the acquisition life-cycle...

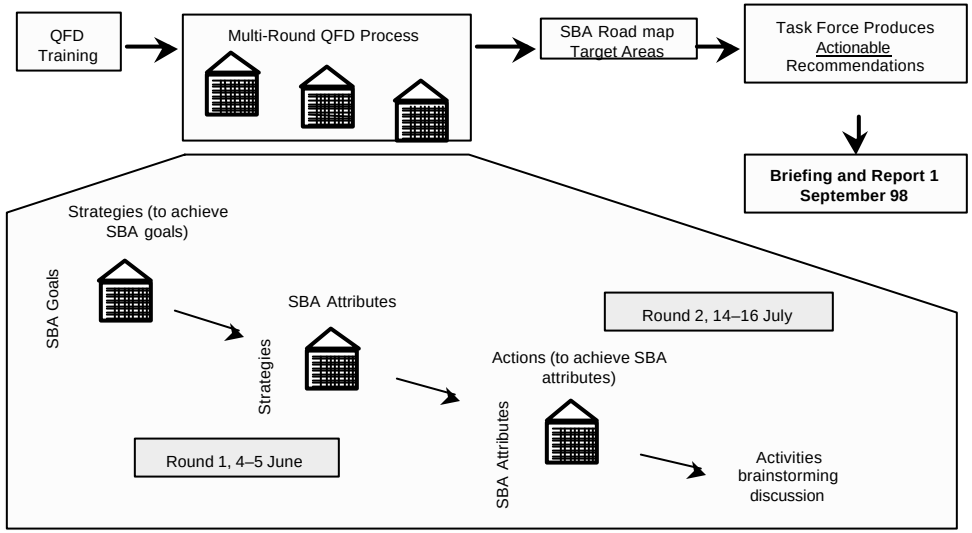
SBA OPERATIONAL CONCEPT



Extensive Re-use Across Functions, Phases and Acquisition Programs

TASK FORCE QUALITY FUNCTION DEPLOYMENT (QFD) PROCESS

QFD: A structured, iterative process to sort group priorities



SBA QFD

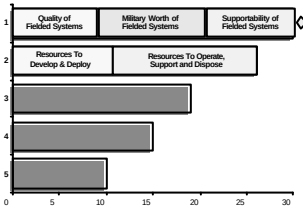
- Group training
- 40- 45 members throughout
- Broad spectrum of specialties
- Consistent agreement in results
- Representing all services, industry, OSD, defense agencies

Joint Simulation Based Acquisition(SBA) Task Force

SBA QUALITY FUNCTION DEPLOYMENT (QFD) "GOAL-TO-ACTION" DOWNLINK RELATIONSHIPS

(For purposes of illustrative clarity,…not all links shown)

SBA GOALS

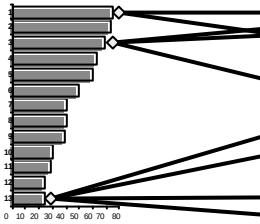


1 - Improve defense systems
2 - Reduce total ownership cost (TOC) throughout the total life cycle
3 - Reduce time required to progress from concept to deployment
4 - Reduce the risk associated with the entire acquisition process
5 - Enable IPPD across the entire acquisition life cycle

LEGEND
Strong Link
Moderate Link
Weak Link

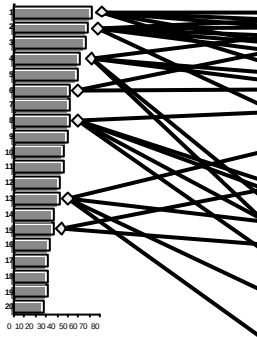
Note: For clarity,…not all links shown

SBA STRATEGIES



1 - Facilitate interoperability of models, simulations and tools
2 - Involve all stakeholders in acquisition process early and continuously
3 - Develop & implement SBA architecture framework
4 - Re-Use models, simulations and tools across acquisition phases and programs
5 - Implement a collaborative and open Enterprise wide Government Industry environment
6 - Exploit M&S enabling technologies
7 - Implement supportive and responsive management structures
8 - Invest in model, simulation and tool research and development
9 - Provide a means to manage Total Ownership Cost
10 - Modify DOD acquisition/budget policy
11 - Implement modified business practices and property agreements in industry
12 - Educate all stakeholders in SBA
13 - Seek changes in Federal Acquisition Regulations and legislation

SBA ATTRIBUTES



1 - DOD/Industry Enterprise wide standards for M&S inter-operability and data interchange
2 - DOD/Industry SBA collaborative environments for mission areas
3 - Sharing of models, simulations, and data between DOD and Industry
4 - Incentives for reuse, inter-operability, and SBA implementation
5 - Online DOD/Industry repository for models, simulations, tools and information
6 - Industry partnership agreements for model and simulation sharing
7 - Authoritative threat and natural environment models, simulations and data
8 - Identified OSD-level responsibility for SBA implementation
9 - Access controls to protect proprietary and classified information
10 - VV&A process for models and simulation, and VV&C process for data
11 - Configuration management process and controls
12 - Distributed Product Descriptions evolving throughout the acquisition life cycle
13 - Single DOD SBA policy & implementation streamlined common Government acquisition
14 - Predictive Total Ownership Cost models and tools
15 - Identified Service-level responsibility for SBA implementation
16 - Education & training resources of SBA implementation
17 - Process and tools for risk and expectation management
18 - An integrated, streamlined test and evaluation process
19 - Iterative spiral development process
20 - Available metrics and ROI indications for SBA implementations

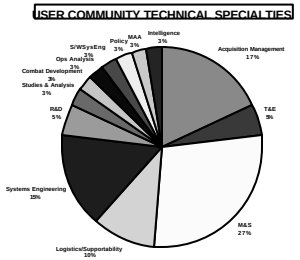
SBA ACTIONS

1 - Implement appropriate collaborative environments
2 - Define, adopt, and develop relevant standard data interchange formats (DIFs) for the SBA architecture
3 - Establish a concept of operations for use of Distributed Product Descriptions (DPDs) throughout the acquisition life cycle
4 - Establish and resource a process for populating and managing an online DoD/Industry repository
5 - Define and develop a "reference" systems and technical architecture for implementing a collaborative environment
6 - Implement technical mechanisms to protect proprietary and classified information
7 - Identify and provide core funding support for SBA
8 - Establish consistent multi-level M&S frameworks
9 - Establish VV&A / VV&C process for determining authorities for models, simulations, and data
10 - Establish Service/Agency ownership authority for models, simulations, tools, and data in the SBA systems architecture
11 - Establish a standard set of threat models, threat laydowns, and data, and identify proper ownership
12 - Establish a standard set of environmental models and data, and identify proper ownership
13 - Encourage and leverage DoD/Industry partnership opportunities
14 - Fund development of standard family of authoritative TOC models and tools and establish management decision usage policy
15 - Invest in technologies and facilities to support SBA
16 - Establish OSD OPRICRs to develop and execute implementation plan for SBA
17 - Establish Service OPRs/IOCRs to develop and execute Service implementation plans for SBA activities
18 - Identify and fund pilot programs to address technical challenges and SBA architecture
19 - Ensure availability of network resources to support SBA
20 - Identify gaps and develop tools for SBA implementation
21 - Coordinate SBA technical architecture implementation with related architecture efforts
22 - Integrate program management tools into SBA architecture
23 - Implement source selection factors to incentivize SBA implementation by Industry
24 - Integrate M&S into the T&E process
25 - Resolve obstacles to SBA implementation in current acquisition policy
26 - Establish compensation mechanisms and an award program for SBA implementation
27 - Coordinate SBA policy implementation, and define relationships, with related DoD policy initiatives
28 - Provide readily available SBA education, training, and information sharing mechanisms
29 - Stabilize acquisition program resources over milestone boundaries
30 - Industry implement investment programs to accelerate SBA
31 - Develop education programs on goals and benefits of SBA
32 - Implement pilot "demonstration projects" to identify metrics and ROI indications for SBA
33 - Incorporate budget policy and practice changes in modified acquisition policy
34 - ID opportunities to leverage SBA-related investments in "non-traditional" acquisition programs

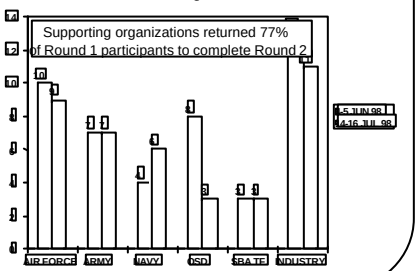
JOINT SBA TASK FORCE QUALITY FUNCTION DEPLOYMENT(QFD) COALITION

The representation in the QFD Coalition was specifically designed to bring together the broad acquisition knowledge, specific technical specialties, and unique organizational requirements that are considered fundamental to identify key SBA needs

COALITION EXPERIENCE



HIGH EXPERIENCE CONTINUITY ACROSS TWO QFD ROUNDS



Strategies

1 - Facilitate interoperability of models, simulations and tools

2 - Involve all stakeholders in acquisition process early and continuously

3 - Develop & implement SBA architecture framework

4 - Re-Use models, simulations and tools across acquisition phases and programs

5 - Implement a collaborative and open Enterprise wide Government Industry environment

6 - Exploit M&S enabling technologies

7 - Implement supportive and responsive management structures

8 - Invest in model, simulation and tool research and development

9 - Provide a means to manage Total Ownership Cost

10 - Modify DOD acquisition/budget policy

11 - Implement modified business practices and property agreements in industry

12 - Educate all stakeholders in SBA

13 - Seek changes in Federal Acquisition Regulations and legislation

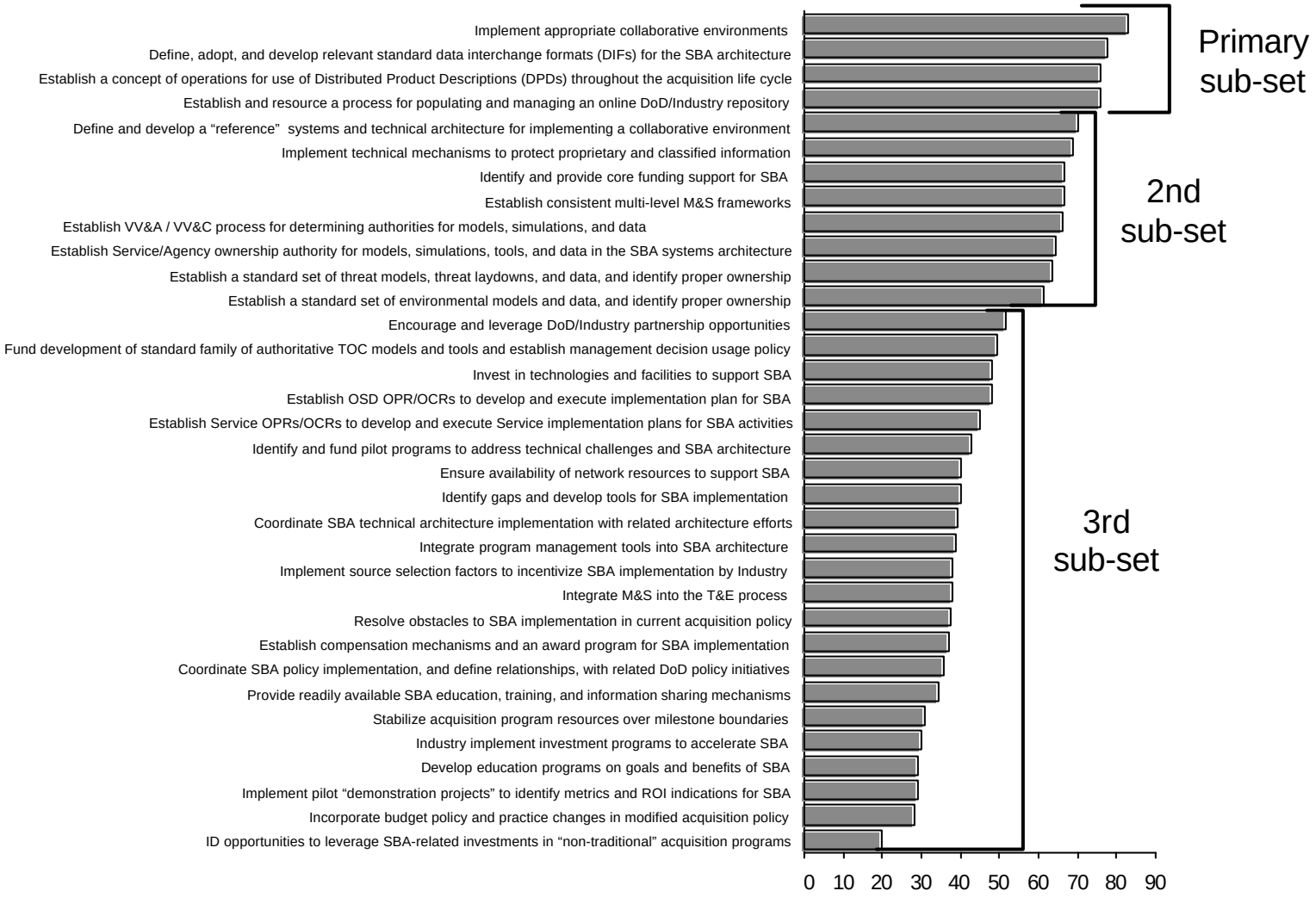
Attributes

1 - DOD/Industry Enterprise wide standards for M&S inter-operability and data interchange
2 - DOD/Industry SBA collaborative environments for mission areas
3 - Sharing of models, simulations, and data between DOD and Industry
4 - Incentives for reuse, inter-operability, and SBA implementation
5 - Online DOD/Industry repository for models, simulations, tools and information
6 - Industry partnership agreements for model and simulation sharing
7 - Authoritative threat and natural environment models, simulations and data
8 - Identified OSD-level responsibility for SBA implementation
9 - Access controls to protect proprietary and classified information
10 - VV&A process for models and simulation, and VV&C process for data
11 - Configuration management process and controls
12 - Distributed Product Descriptions evolving throughout the acquisition life cycle
13 - Single DOD SBA policy & implementation streamlined common Government acquisition
14 - Predictive Total Ownership Cost models and tools
15 - Identified Service-level responsibility for SBA implementation
16 - Education & training resources of SBA implementation
17 - Process and tools for risk and expectation management
18 - An integrated, streamlined test and evaluation process
19 - Iterative spiral development process
20 - Available metrics and ROI indications for SBA implementations

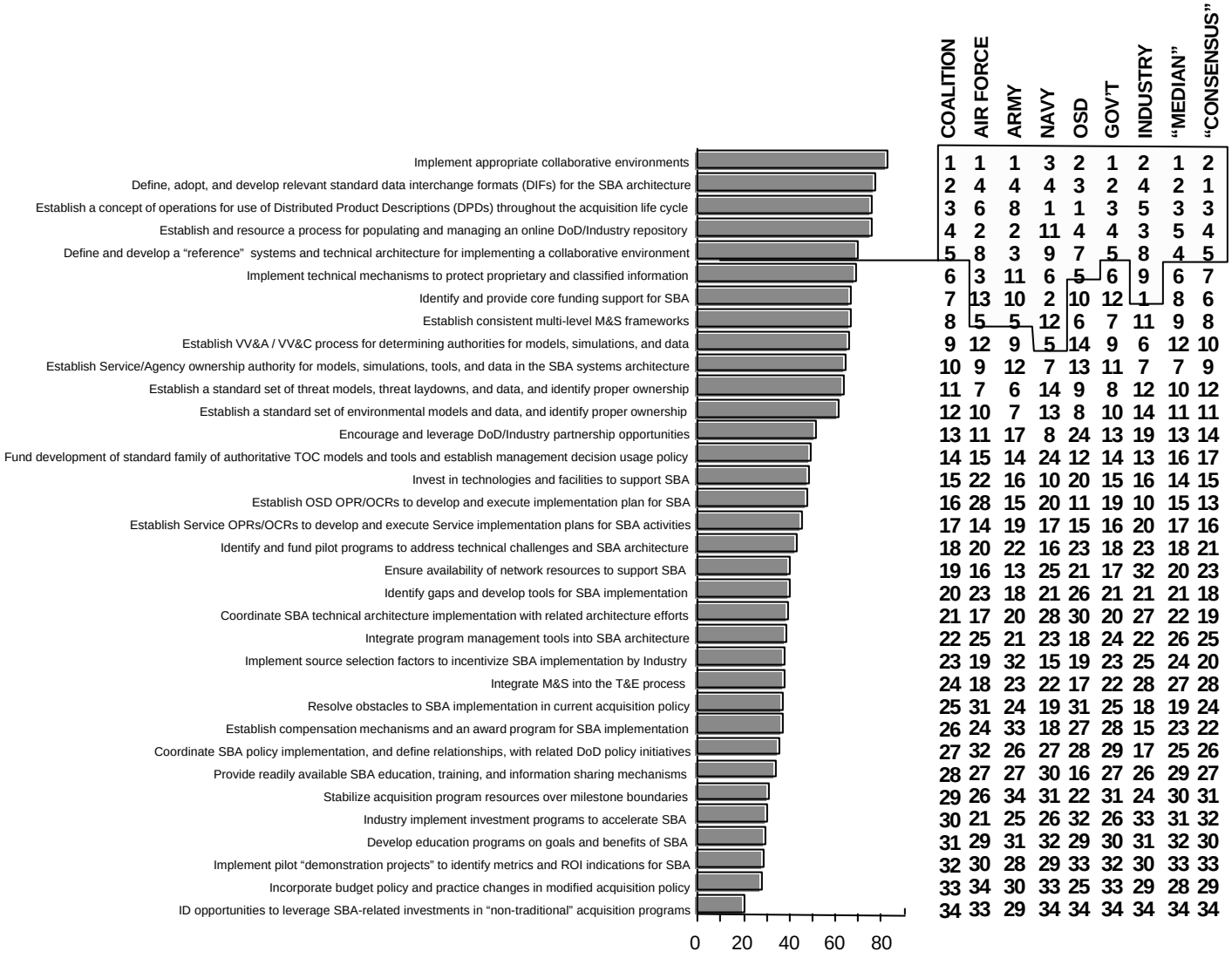
Actions

1 - Implement appropriate collaborative environments
2 - Define, adopt, and develop relevant standard data interchange formats (DIFs) for the SBA architecture
3 - Establish a concept of operations for use of Distributed Product Descriptions (DPDs) throughout the acquisition life cycle
4 - Establish and resource a process for populating and managing an online DoD/Industry repository
5 - Define and develop a "reference" systems and technical architecture for implementing a collaborative environment
6 - Implement technical mechanisms to protect proprietary and classified information
7 - Identify and provide core funding support for SBA
8 - Establish consistent multi-level M&S frameworks
9 - Establish VV&A / VV&C process for determining authorities for models, simulations, and data
10 - Establish Service/Agency ownership authority for models, simulations, tools, and data in the SBA systems architecture
11 - Establish a standard set of threat models, threat laydowns, and data, and identify proper ownership
12 - Establish a standard set of environmental models and data, and identify proper ownership
13 - Encourage and leverage DoD/Industry partnership opportunities
14 - Fund development of standard family of authoritative TOC models and tools and establish management decision usage policy
15 - Invest in technologies and facilities to support SBA
16 - Establish OSD OPR/OCRs to develop and execute implementation plan for SBA
17 - Establish Service OPRs/OCRs to develop and execute Service implementation plans for SBA activities
18 - Identify and fund pilot programs to address technical challenges and SBA architecture
19 - Ensure availability of network resources to support SBA
20 - Identify gaps and develop tools for SBA implementation
21 - Coordinate SBA technical architecture implementation with related architecture efforts
22 - Integrate program management tools into SBA architecture
23 - Implement source selection factors to incentivize SBA implementation by Industry
24 - Integrate M&S into the T&E process
25 - Resolve obstacles to SBA implementation in current acquisition policy
26 - Establish compensation mechanisms and an award program for SBA implementation
27 - Coordinate SBA policy implementation, and define relationships, with related DoD policy initiatives
28 - Provide readily available SBA education, training, and information sharing mechanisms
29 - Stabilize acquisition program resources over milestone boundaries
30 - Industry implement investment programs to accelerate SBA
31 - Develop education programs on goals and benefits of SBA
32 - Implement pilot "demonstration projects" to identify metrics and ROI indications for SBA
33 - Incorporate budget policy and practice changes in modified acquisition policy
34 - ID opportunities to leverage SBA-related investments in "non-traditional" acquisition programs

“ACTION” RELATIVE IMPORTANCE



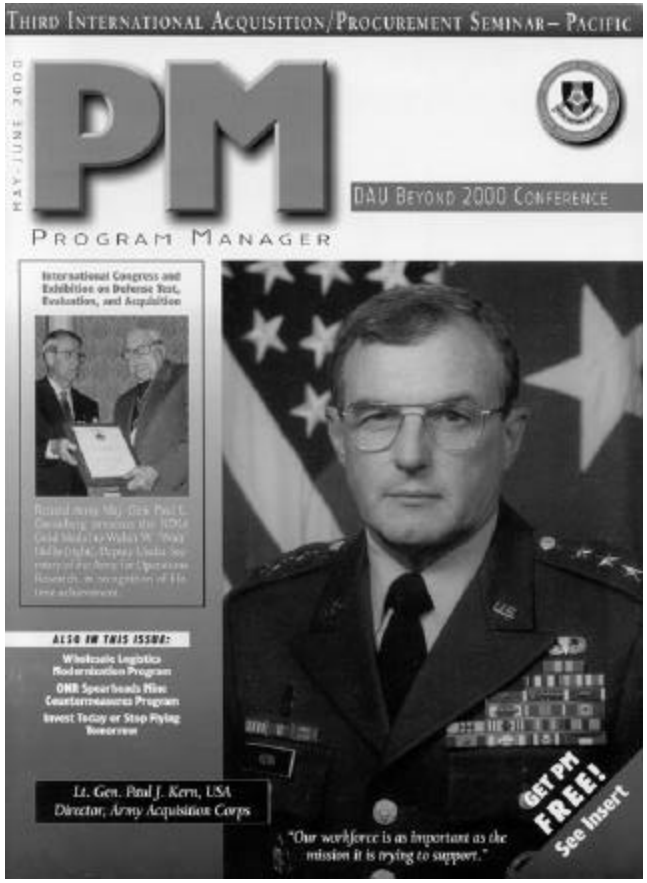
ACTION RANKINGS



TOP FOUR SBA ACTIONS FROM QFD

- **Implement appropriate collaborative environments**
- **Define, adopt, and develop relevant standard data interchange formats (DIFs) for the SBA architecture**
- **Establish a concept of operations for use of Distributed Product Descriptions (DPDs) throughout the acquisition life cycle**
- **Establish and resource a process for populating and managing an online DoD/Industry repository**

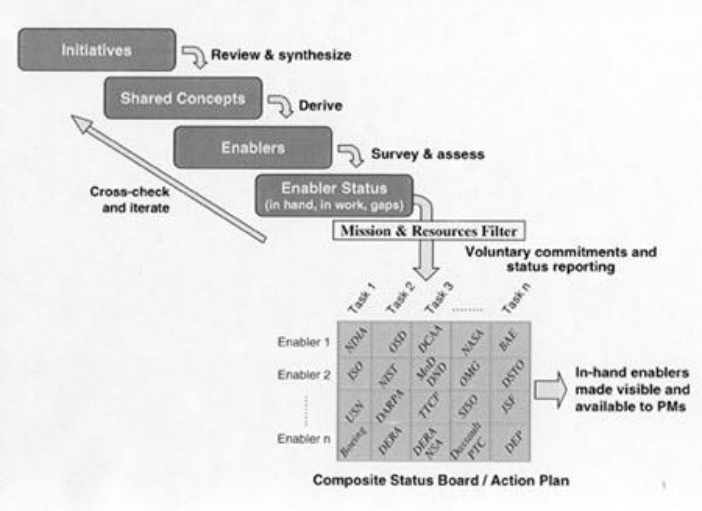
Simulation & Modeling for Acquisition, Requirements and Training (SMART)



- **Army initiative applying M&S technology to system development and life-cycle costs**
- **Motivate PMs to adopt SMART**
  - SBA Flagship programs -- share implementation experience
  - Leverage others' work - DARPA/ NASA
  - Promote awareness within acquisition, key stakeholder communities -- annual SMART conferences

SMART 2001 --
Facing the Digital Frontier Together
Apr 16-19, Hyatt Orlando Hotel
http:// www.amso.army.mil/SMART

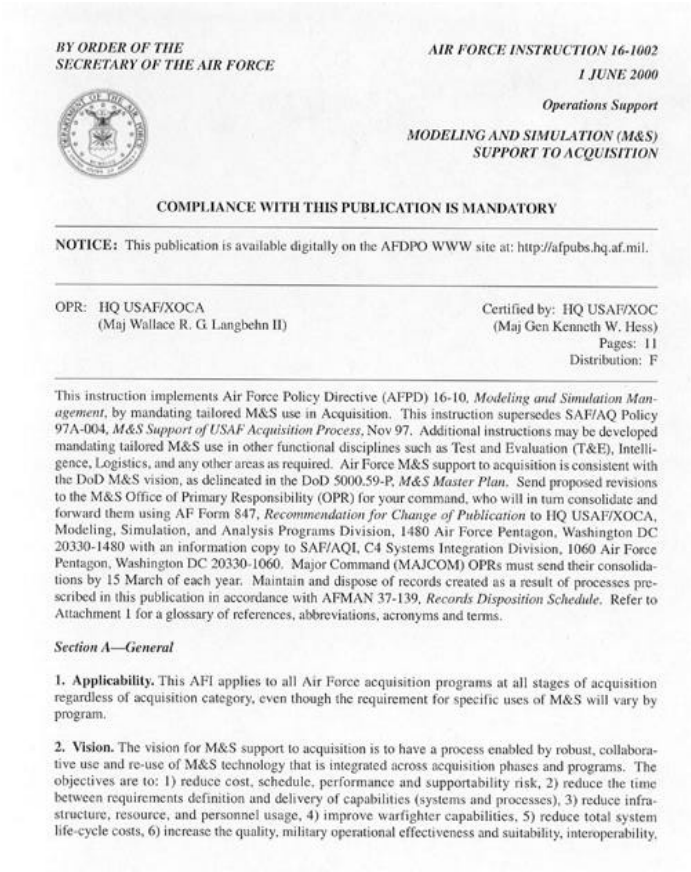
Navy



- **Campaign plan to address SBA implementation challenges (technical and cultural)**
- **Process contained in 01S-SIW-091**
- **SBA investment business case based on ROI at two levels:**
  - Program level -- faster smarter decisions, better product at lower cost
  - Corporate Level -- S-O-S focus yield more affordable programs

http://www.ar.navy.mil (look under SBA)

Air Force



BY ORDER OF THE
SECRETARY OF THE AIR FORCE

AIR FORCE INSTRUCTION 16-1002
1 JUNE 2000

Operations Support

MODELING AND SIMULATION (M&S)
SUPPORT TO ACQUISITION

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

NOTICE: This publication is available digitally on the AFDPO WWW site at: http://afpubs.hq.af.mil.

OPR: HQ USAF/XOCA
(Maj Wallace R. G. Langbehn II)

Certified by: HQ USAF/XOC
(Maj Gen Kenneth W. Hess)
Pages: 11
Distribution: F

This instruction implements Air Force Policy Directive (AFPD) 16-10, *Modeling and Simulation Management*, by mandating tailored M&S use in Acquisition. This instruction supersedes SAF/AQ Policy 97A-004, *M&S Support of USAF Acquisition Process*, Nov 97. Additional instructions may be developed mandating tailored M&S use in other functional disciplines such as Test and Evaluation (T&E), Intelligence, Logistics, and any other areas as required. Air Force M&S support to acquisition is consistent with the DoD M&S vision, as delineated in the DoD 5000.59-P, *M&S Master Plan*. Send proposed revisions to the M&S Office of Primary Responsibility (OPR) for your command, who will in turn consolidate and forward them using AF Form 847, *Recommendation for Change of Publication* to HQ USAF/XOCA, Modeling, Simulation, and Analysis Programs Division, 1480 Air Force Pentagon, Washington DC 20330-1480 with an information copy to SAF/AQI, C4 Systems Integration Division, 1060 Air Force Pentagon, Washington DC 20330-1060. Major Command (MAJCOM) OPRs must send their consolidations by 15 March of each year. Maintain and dispose of records created as a result of processes prescribed in this publication in accordance with AFMAN 37-139, *Records Disposition Schedule*. Refer to Attachment 1 for a glossary of references, abbreviations, acronyms and terms.

Section A—General

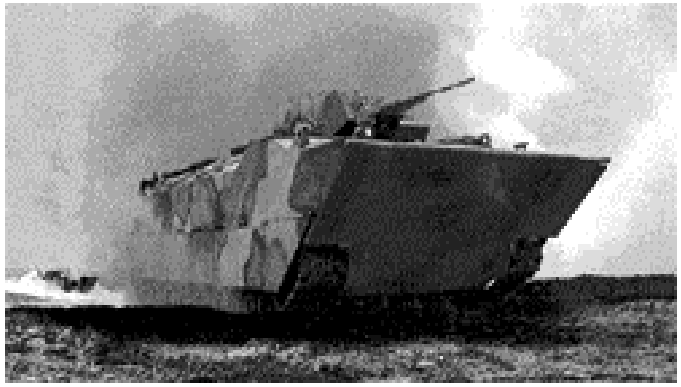
1. Applicability. This AFI applies to all Air Force acquisition programs at all stages of acquisition regardless of acquisition category, even though the requirement for specific uses of M&S will vary by program.

2. Vision. The vision for M&S support to acquisition is to have a process enabled by robust, collaborative use and re-use of M&S technology that is integrated across acquisition phases and programs. The objectives are to: 1) reduce cost, schedule, performance and supportability risk, 2) reduce the time between requirements definition and delivery of capabilities (systems and processes), 3) reduce infrastructure, resource, and personnel usage, 4) improve warfighter capabilities, 5) reduce total system life-cycle costs, 6) increase the quality, military operational effectiveness and suitability, interoperability,

- **AFI 16-1002, *M&S Support for Acquisition* -- policy framework for SBA elements**
  - Guides direction of M&S in AF acquisition
  - Implement DoD policy for M&S use in acquisition
  - Links M&S use in acquisition to requirements generation, testing, logistics, education
- **SBA program development and management at ESC**
  - Plan for implementation of funded SBA infrastructure program

http://www.msiac.dmso.mil/sba

AAAV VI&A



- Purpose: Improve handling and dissemination of assembly drawings and corrections during PDRR phase of AAAV
- Used www technologies and techniques to gain unprecedented efficiencies during fabrication of vehicle prototypes in PDRR phase
  - **CADs are turned into easily understandable assembly drawings and instructions and disseminated over an intranet**
  - **Problem Resolution System allows real-time capture/resolution of assembly problems**
- Reduced cost and schedule risks through greater interaction between mechanics and system developers
- A DMSO 1998 Acquisition Award Winner

WPAFB JSF Virtual SBA

- Purpose: Develop and execute a series of A-to-G/A-to-A real time virtual simulations
- Created a virtual environment where systems are experienced and capabilities evaluated before committing to product design and production
  - **Planned and developed as a framework that can span multiple phases of the acquisition process and can support multiple programs singly or jointly**
  - **Virtual simulations faithfully address issues which are relevant and important**
- Enabled development of CONOPS well before MSII, substantially reducing acquisition risks
- A DMSO 1998 Acquisition Award Winner

Integrated Ship Defense

- Purpose: To demonstrate comprehensive M&S capability in support of ISD design and evaluation
- Focused on new technologies critical to developing an infrastructure that supports the consistent use to CAE and simulation technologies in all phases of the acquisition life cycle.
  - **Employed HLA to develop an ISD Federation**
  - **Emphasized collaboration between the most authoritative sources**
- Being leveraged to reduce cost and risk of total ship combat system testing.
- A DMSO 1999 Acquisition Award Winner

ARAM

- Purpose: To develop simulation that accurately predicts the complex dynamic effects on aircraft structures, resulting from exploding projectiles
- Simulation provides pretest predictions with a degree of accuracy greater than 85%
  - **validated through live fire tests**
  - **capability significantly exceeds that of commercially available hydro-codes**
- Reduces risk of redesigns and delays thereby reducing risks to budgets, production schedules, force structure modernization plans and interim operational capability
- A DMSO 1999 Acquisition Award Winner

ARAM (cont.)

"With this new model, we can perform vulnerability and survivability analyses and make the appropriate tradeoffs very early in the design stage of new aircraft. The risk reduction and cost savings should be substantial for the JSF as we address two of the most challenging aspects of the program – survivability and affordability."

Frank J. Cappuccio

vice president and program manager

Lockheed Martin JSF

"Where others have done a reasonable job of simply predicting ram pressures and generating crude estimates of structural response, you repeatedly provide pre-test predictions with a degree of accuracy that includes the failure prediction of individual fasteners. This degree of modeling accuracy was previously thought impossible."

Greg Czarnecki

survivability engineer

U.S. Air Force Wright Laboratories

DOT&E HICKS SURVEY

- **Sponsored by DOT&E**
- **Data collected from 21 programs, Mar-Sept ‘99**
- **Results:**
  - **Programs must invest early in M&S to make a difference in acquisition**
  - **Additional effort is required for M&S to support acquisition**
  - **Need improved understanding of M&S management for SBA success**
  - **Industry plays a predominant role in M&S development and ownership**

OTHER GOVERNMENT AGENCIES & INDUSTRY

- **Other Government Agencies (OGA)**
  - **ISE: Intelligent Synthesis Environment (NASA)**
  - **AEE: Advanced Engineering Environments (NRC)**
  - **IMTI: Integrated Manufacturing Technology Initiative (DARPA, DOC/NIST, DOE, NSF, NASA)**
- **Industry**
  - **TEWE - Technologies for Enterprise-Wide Engineering**
  - **VPDI - Virtual Product Development Initiative (Lockheed Martin)**
  - **CCPD - Concurrent Product and Process Development (Caterpillar)**

Boeing, SBA and the JSF
Cost reductions through M&S

"The JSF X-32A … symbol of lean design and manufacturing… produce affordable military aircraft …three dimensional solid modeling and assembly simulation, laser guided part positioning, and minimum tooling … reduced overall fabrication and assembly costs … 30 to 40 percent below projections that are already low compared to previous aircraft development programs."
(Source: Boeing press release, 14 June 1999)

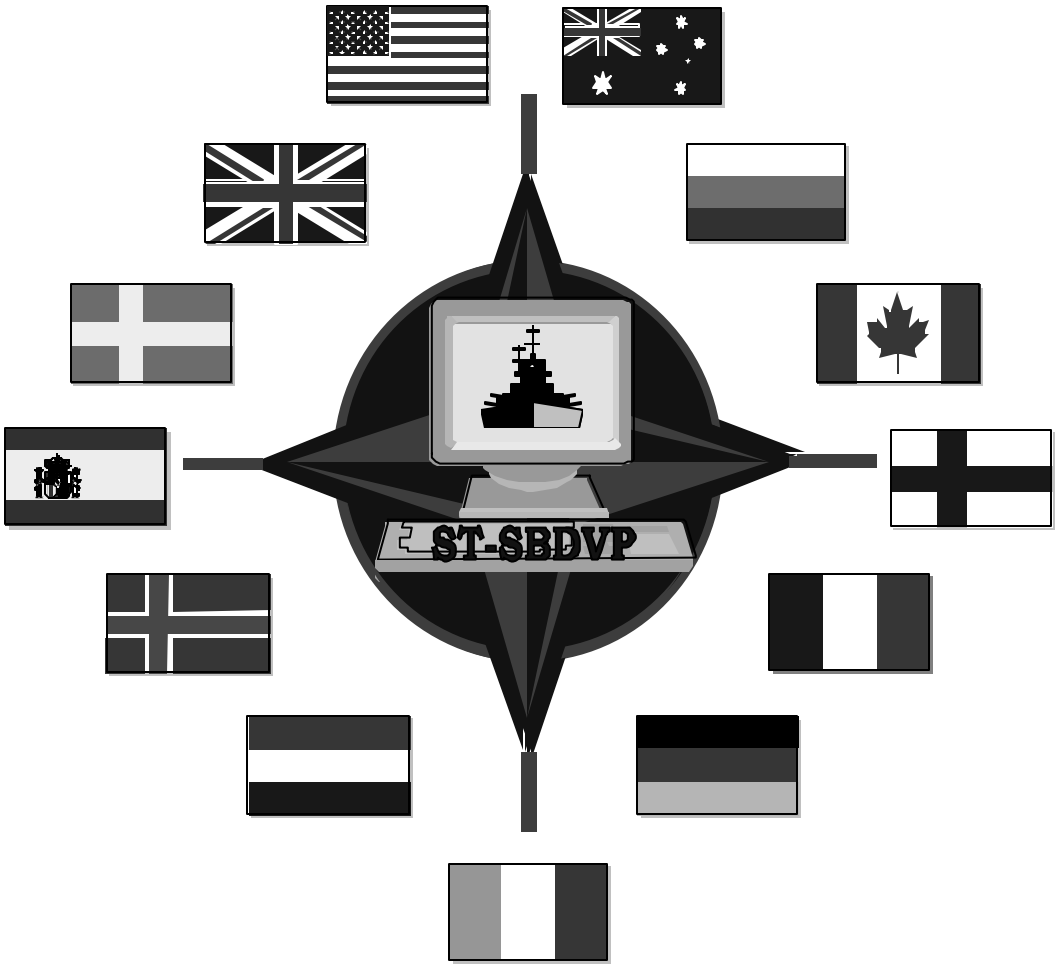
Lockheed Martin, SBA, and the JSF
International Standards and Reuse

"Lockheed Martin…and Dutch industrial and research groups… demonstrated new simulation approach that enhances…ability to (re)use existing models in complex distributed simulations…over a world-wide network...using the new High Level Architecture…developed by DoD…making simulation more effective while avoiding expense of developing new models...10 different models were linked into a single, distributed simulation, similar to what is envisioned for future JSF pilot training…meets program requirements of interoperability, affordability, readiness, and concurrency."
(Source: Lockheed Martin press release, 12 Sep 2000)

International Initiatives
UK - SeBA

- **Dismounted Infantry Virtual Environment**
  - To research and develop *low cost* virtual environments for dismounted close-combat trials
- **Secure SE for CIS**
  - To investigate the application of SE to stimulate CIS systems and support the concept development, specification, and testing of future CIS designs and procurements
  - To allow a single SE to handle multiple levels of classification
- **Cost-modeling for SE**
  - To improve the integration of cost-modeling within SE used to support procurement
- **Realizing the potential of SE (EUCLID)**
  - To research and develop tools, techniques, and standards to reduce the time, cost, and complexity of setting up a SE and to increase the flexibility and re-usability of a SE

NATO NAVAL ARMAMENTS GROUP



NATO Interoperability and Reuse Study

N I R E U S

- **Purpose: Apply HLA to the study of helicopter and maritime unmanned air vehicle landings on ships**
- **Demonstrate multi-national simulation interoperability**

  - Design and develop an engineering-level HLA Federation with a multi-national team

  - Implement Federation of multi-national federates
- **Design in place by Sep 00, Federation in place by Sep 01**

A Crowded Playing Field

- Many other initiatives, projects and activities are also seeking to improve the system acquisition (product development) process
  - **Within the DoD**
  - **Elsewhere in government**
  - **Across both the commercial and defense industries**
  - **In academic institutions and consortia**
  - **Around the globe**
- Despite different names, objectives and focus areas, they have many similarities

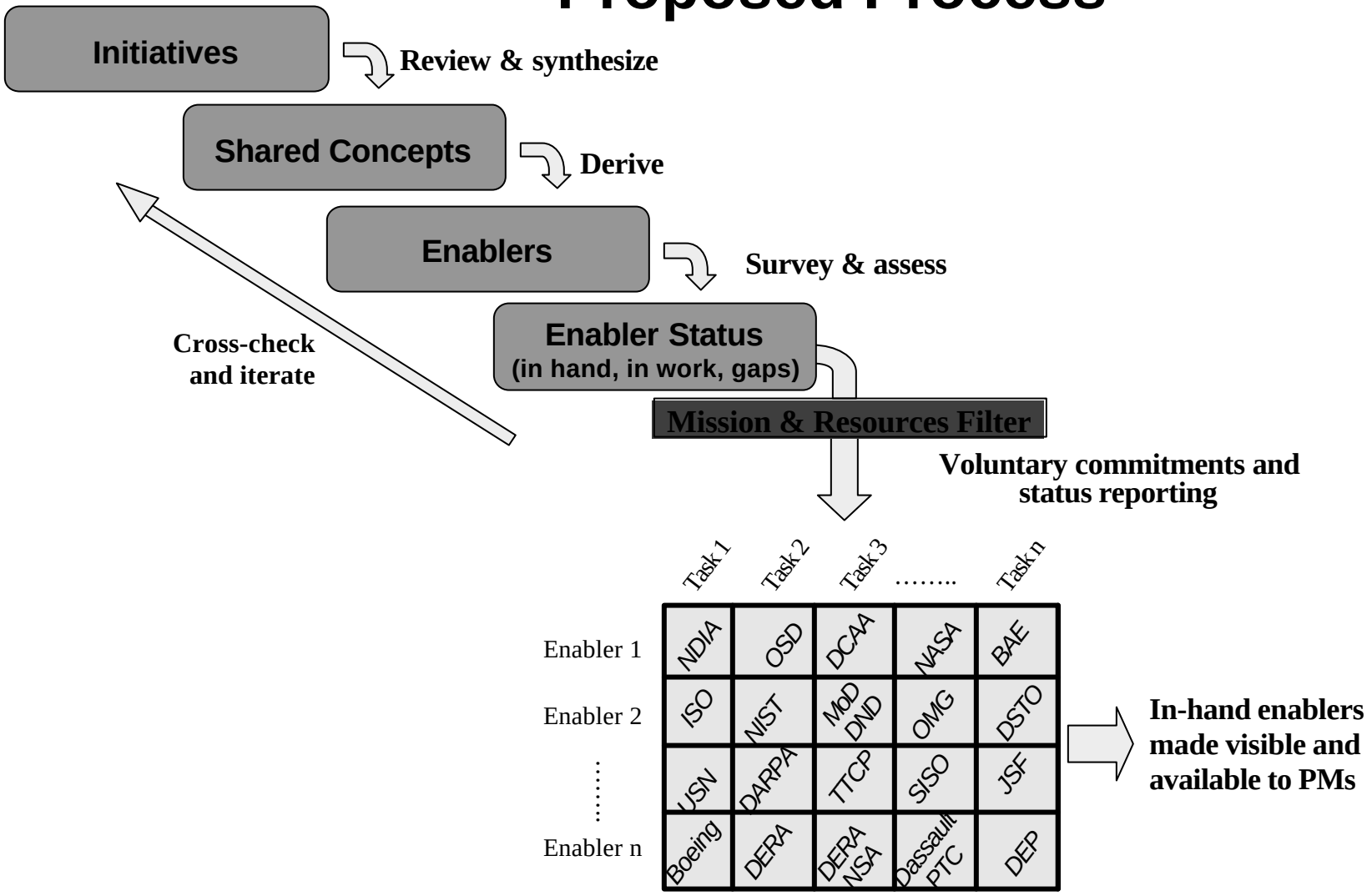
Shared Concepts

- Faster and better decisions/transactions among dispersed parties through digital information sharing and electronic interactions
- Early and continuing collaborative exploration of the largest possible trade space, including requirements, across the life cycle
- Conceiving, designing, testing and managing to optimize "system of systems" attributes
- M&S-based assessments early in the development cycle; alternative system designs built, tested and operated in the computer before critical decisions are locked-in and manufacturing begins
- Flexible, iterative mixing of simulations and hardware
- Reduction of activities more cost-effectively performed in M&S, such as drawings, mock-ups, prototypes and some aspects of live testing
- Maximum reuse of all acquisition resources - information, software, expertise, facilities, etc. – across phases, programs, organizations

Forging a Collaborative Approach

- The need for certain enabling abilities - enablers - is inherent in each of these shared concepts
  - *Enabler*: Any ability that must be present to allow one or more of the cited concepts to be instantiated. May be procedural, technical or cultural.
- None of the organizations or initiatives has the resources (money, talent, time) it needs
- Realization of the enablers can be most rapid and cost-effectively if the various parties collaborate
- Ideally such collaboration should span government, industry and academia, both nationally & internationally
- Is this feasible?

Proposed Process



Enabler Classes
(Baseline Class Structure)

- Policy, law and organizational changes **(Concepts a, c, d, f, g)**
- Process changes **(a, b, c, d, e, f, g)**
- Standards for data interchange **(a, b, c, d, e, g)**
- Standards for M&S software application interoperability **(b, c, d, e, g)**
- Authoritative information sources **(a, b, c, d, f, g)**
- Capable, reusable models and simulations **(b, c, d, e, f, g)**
- Means to manage collaboration & multi-domain optimization **(b, c, d)**
- Means to identify, protect & obtain reusable resources **(a, b, c, d, e, f, g)**
- Business case evidence **(a, b, c, d, e, f, g)**
- Education, motivation & evolution of work force **(a, b, c, d, e, f, g)**

Note: Well-understood and broadly available enablers (e.g., computers, networks, communication protocols) are omitted for clarity

Support for this Approach

- DoD Acquisition Council
- The Technical Cooperation Program (TTCP) *Systems Engineering for Defense Modernization* panel (JSA TP4)
  - Australia, Canada, (New Zealand), United Kingdom, United States
- NDIA SBA Industry Steering Group
  - NDIA Systems Engineering Committee subgroup
  - Framework for 15-17 May 2001 SBA conference

Enabling the 21st Century Acquisition Enterprise

- Who (should attend):
  - Acquisition (Program Managers, Contracting Officers, Technical Directors/Chief Engineers) and M&S Practitioners
- What (is the venue):
  - Presentations and panel discussions by senior DoD and Industry leaders
  - Presentations and discussions on the key policy, technical, and cultural changes associated with advanced acquisition environments that benefit the PM
  - Informational displays depicting how current programs use SBA concepts
- When: **May 15 - 17, 2001**
- Where: **Springfield Hilton, Springfield VA**

http://www.ndia.org -- Meetings and Events Section (bottom of page)

Summary

“Modeling and simulation is absolutely fundamental to the process of system engineering. It helps us understand the problem to be solved. It helps us assess different solutions to that problem. It helps us predict performance, … and to help determine whether or not the solutions are those that we predicted and whether or not they are adequate.”

RADM Kathleen K. Paige
Chief Engineer
Assistant Secretary of the Navy (RD&A)
DMSO Industry Days, May 24, 2000

Air Force Lt. Gen. Ronald T. Kadish Speech to the Defense Writers Group, 9 May 2000

The lack of operational tests for the complex system of radars, interceptor missiles and high speed computers is "anomalous" for the Department of Defense, said Air Force LtGen. Ronald T. Kadish, commander of the Pentagon's Ballistic Missile Defense Organization.

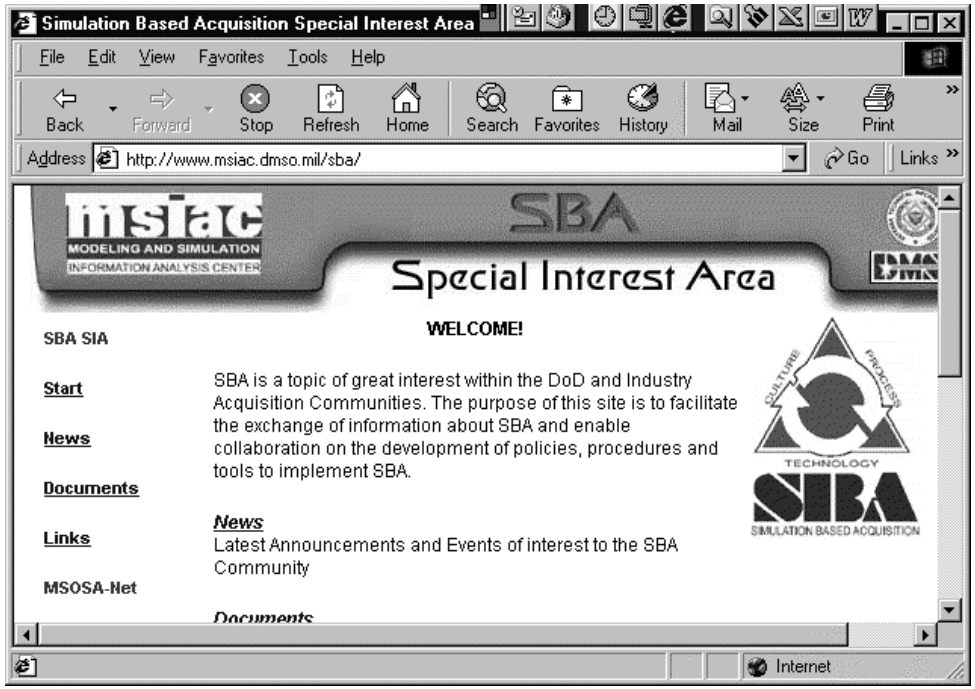
"We think the design we have will be successful." But elaborating in greater detail than before on the risks involved in the schedule, Kadish said that engineers will have to rely more than usual on computer simulations based on hypothetical data rather than the results of flight tests.

"We have talked a lot about doing simulation-based acquisition, and this is the one," Kadish said.

Washington Post Tuesday, May 9, 2000

For the latest on SBA….

http://www.msiac.dmso.mil/sba/



SBA ISG Reflector
acquisition-isg-subscribe@lists.dmso.mil

BACKUP

POLICY EFFORTS TO DATE

- **The elevation of M&S to a key element of the Acquisition Strategy (Change 4 to DoD 5000.2-R, 11 May 1999)**
- **Incorporation of Simulation Test and Evaluation Process (STEP) into DoD 5000.2R**
- **Section 2.9, *M&S in Acquisition,* of the Defense Acquisition Deskbook**

DoD 5000 series rewrite
Proposed M&S Wording

- **Adds a paragraph on Simulation Based Acquisition in DoDD 5000.1**
- **Emphasizes the need for M&S planning. Planning is to be done early in the program to ensure maximum benefit from M&S and to ensure needed resources are identified**
- **Includes a section on SBA in DoD 5000.2-R**
- **If M&S is to be used to evaluate proposals, then they will be identified and available well in advance of the RFP**
- **Addresses M&S standards**

Section 5.2.2
Simulation Based Acquisition (SBA)

The PM shall judiciously employ and reuse advanced M&S and related technologies. DoD and industry shall collaborate to produce integration and interoperability capabilities spanning all acquisition functions and phases. Expected results include improved acquisition program execution and superior acquired systems.

PMs shall leverage M&S and related technologies as part of the M&S approach supporting the acquisition strategy (AS) and program design. They shall properly integrate M&S and related technologies throughout systems acquisition. They shall identify and employ knowledge representation and communication techniques and procedures associated with the design, development, and life cycle of both the program and its system early in and throughout the program, as appropriate.